

## SECTION 16521 - EXTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes exterior lighting units with luminaires, lamps, ballasts, poles/support structures, and accessories.
- B. Related Sections include the following:
  - 1. Division 16 Section "Interior Lighting" for interior fixtures, lamps, ballasts, emergency lighting units, and accessories; and for exterior luminaires normally mounted on buildings.

#### 1.3 DEFINITIONS

- A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including pole, post, or other structure, and mounting and support accessories.
- B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.

#### 1.4 SUBMITTALS



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- A. Product Data: For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
    - 1. Materials and dimensions of luminaires and poles.
    - 2. Certified results of laboratory tests for fixtures and lamps for photometric performance.
    - 3. High-intensity-discharge luminaire ballasts.
  - B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

#### 1.5 QUALITY ASSURANCE

- A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by a testing agency acceptable to authorities having jurisdiction
- B. Comply with ANSI C2.
- C. Comply with NFPA 70.
- D. FM Compliance: Units for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM.

#### 1.6 DELIVERY, STORAGE, AND HANDLING OF POLES

- A. Store poles on decay-resistant treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- B. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent surface more than 1/4 inch (6 mm) deep. Do not apply tools to section of poles below ground-line.



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- C. Retain factory-applied pole wrappings on fiberglass poles until just before pole installation. Handle poles with web fabric straps.
  - D. Retain factory-applied pole wrappings on metal poles until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

## 1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by manufacturer and Installer agreeing to replace external parts of luminaires and poles exhibiting a failure of finish as specified below. This warranty is in addition to, and not a limitation of, other rights and remedies Owner may have under requirements of the Contract Documents.
  - 1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.
  - 2. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.
  - 3. Warranty Period: Manufacturer's standard, but not less than three years from date of Substantial Completion.

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.



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2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  3. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  4. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Exterior Lighting Unit Schedule at the end of Part 3.

### 2.2 LUMINAIRES

- A. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- B. Metal Parts: Free from burrs, sharp corners, and edges.
- C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- E. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.



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- F. Exposed Hardware Material: Stainless steel.
  - G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
  - H. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
    - 1. White Surfaces: 85 percent.
    - 2. Specular Surfaces: 83 percent.
    - 3. Diffusing Specular Surfaces: 75 percent.
  - I. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor in luminaire doors.
  - J. High-Intensity-Discharge Ballasts: Comply with ANSI C82.4. Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.
    - 1. Ballast Fuses: One in each ungrounded supply conductor. Voltage and current ratings as recommended by ballast manufacturer.
    - 2. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
    - 3. Open-circuit operation will not reduce average life.
    - 4. High-Pressure Sodium Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
    - 5. Noise: Uniformly quiet operation, with a noise rating of B or better.
  - K. Lamps: Comply with the standard of the ANSI C78 series that is applicable to each type of lamp. Provide luminaires with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a luminaire, provide medium wattage lamp recommended by manufacturer for luminaire.

## 2.3 LUMINAIRE SUPPORT COMPONENTS



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- A. Description: Comply with AASHTO LTS-3 for pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.
- B. Wind-Load Strength of Total Support Assembly: Adequate to carry support assembly plus luminaires at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 100 mph (160 km/h) with a gust factor of 1.3. Support assembly includes pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.
1. Strength Analysis: For each pole type and luminaire combination, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- C. Finish: Match finish of pole/support structure for arm, bracket, and tenon mount materials.
- D. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
1. Materials: Will not cause galvanic action at contact points.
2. Mountings: Correctly position luminaire to provide indicated light distribution.
3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized after fabrication unless stainless-steel items are indicated.
4. Anchor-Bolt Template: Plywood or steel.
- E. Pole/Support Structure Bases: Anchor type with hold-down or anchor bolts, leveling nuts, and bolt covers.
- F. Steel Poles: Tubing complying with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in length with access handhole in pole wall.
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1. Grounding Provisions for Metal Pole/Support Structure: Welded **1/2-inch (12-mm)** threaded lug, accessible through handhole and listed for copper conductor connection.
  2. Shafts: Square, tapered.
- G. Metal Pole Brackets: Match pole metal. Provide cantilever brackets without underbrace, in sizes and styles indicated, with straight tubular end section to accommodate luminaire.
- H. Concrete for Pole Foundations: Comply with Division 3 Section "Cast-in-Place Concrete."
1. Design Strength: **3000-psig (20.7-MPa)**, 28-day compressive strength.

## 2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Concrete Foundations: Construct according to Division 3 Section "Cast-in-Place Concrete."
1. Comply with details for reinforcement and for anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.
  2. Finish for Parts Exposed to View: Trowel and rub smooth. Comply with Division 3 Section "Cast-in-Place Concrete" for exposed finish.
- B. Install poles as follows:
1. Use web fabric slings (not chain or cable) to raise and set poles.



2. Mount pole to foundation with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
3. Secure poles level, plumb, and square.
4. Grout void between pole base and foundation. Use nonshrinking or expanding concrete grout firmly packed in entire void space.
5. Use a short piece of ~~1/2-inch-~~ (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

C. Luminaire Attachment: Fasten to indicated structural supports.

D. Lamp luminaires with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

### 3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.3 FIELD QUALITY CONTROL

A. Inspect each installed unit for damage. Replace damaged units.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

### 3.4 CLEANING AND ADJUSTING





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- A. Clean units after installation. Use methods and materials recommended by manufacturer.

END OF SECTION 16521

